$$s(n) = s(n-3) \oplus s(n-5) \oplus f(n)$$

where f(n) is the logical ones input to a sequence generator, s(n-k) is the tap point after the k-th delay element in the sequence generator and $\oplus$ is modulo-2 addition.

Another example polynomial that may be generated by a communication terminal and is defined by a period equal to 63 is:

$$s(n) = s(n-5) \oplus s(n-6) \oplus f(n)$$

Another example polynomial that may be generated by a communication terminal and is defined by a period equal to 127 is:

$$s(n) = s(n-4) \oplus s(n-7) \oplus f(n)$$

Another example polynomial that may be generated by a communication terminal and is defined by a period equal to 255 is:

$$s(n) = s(n-4) \oplus s(n-5) \oplus s(n-6) \oplus s(n-8) \oplus f(n)$$

The term communication terminal is defined to mean any configuration of software, hardware or both software and hardware configured to facilitate or perform

communication or generate a signal or sequence. In one embodiment the term communication terminal is defined to be a modem. This includes a modem, scrambler, sequence generator or other similar device, or a separate, stand-alone device located at the CPE or C.O. end.

Using the sequence signals, generated by the sequence generator, scrambler, or any other device capable of generating a corresponding sequence signal provides advantages over the prior art.

Receive Module

The receive module 204 of Figure 2 includes the analog to digital converter 240 to transform the received sequence signal from the analog domain to the digital domain. An amplifier (not shown) may be placed between the line interface 208 and the analog to digital converter 240 to amplify the possibly weak sequence signal from the channel 412. In one embodiment, the analog to digital converter 240 comprises a fourteen bit converter. Increasing the precision of the converter improves the dynamic range of the receiver allowing both small and large magnitude signals to be detected, such as those from a very long and very short transmission lines.

The receiver filters 242 comprise standard filters such as high and low pass filters to eliminate unwanted frequency components that are outside of the frequency band of the sequence signal. Any type of digital filtering may be performed by the filters 242. In addition, analog filters (not shown) may be located prior to the analog to digital converter

240 as necessary to filter noise or other signals received from the line interface 238 prior to conversion into the digital domain.

The sequence correlator 246, which receives the output of the receiver filters 242, comprises a configuration of hardware, software, or combination thereof, that is configured to correlate the sequence signal with a copy or duplicate of an original sequence signal that was generated by the sequence generator 220. Although not shown, the sequence correlator 246 may communicate or connect to the sequence generator 220. In one embodiment, the correlation comprises cross correlation. Mathematically, in one embodiment, a crosscorrelator is realizing the following function:

$$h(n) = \sum_{k} C(k) X(k+n)$$

where X(n) is the sum of the transmitted sequence C(n) plus any additive noise and crosstalk. In one embodiment the correlator 246 is embodied using a sliding tapped delay line. There are numerous ways to implement the correlator 246 and this is but one example embodiment. The correlator 246 may be embodied in hardware, or software, or a combination of the two. Indeed, it is contemplated that an analog implementation of the correlator maybe preferred particularly in high rate applications. In this implementation analog to digital converter 240 maybe omitted. In the sliding tapped delay line method the taps are C(n).